J. sustain. environ. peace (2022) 5(1) 87-95

WANGARI MAATHAI INSTITUTE FOR PEACE AND ENVIRONMENTAL STUDIES

Journal of Sustainability, Environment and Peace

ISSN: 2663-4627

Home page: http://www.jsep.uonbi.ac.ke

JSEP

Original Article

Recreational green spaces as the future for sustainable cities: Case of Karura Forest in Nairobi, Kenya

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Article history:
Received: 17 August 2021
Revised: 09 December 2021
Accepted: 25 February 2022
Available online: 02 June 2022

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Key words:
recreaton;
sustainability;
green spaces;
urbanisation;
visitor preferences

ABSTRACT

Urban areas have been experiencing unprecedented growth since the beginning of the 20th century. Rapid urbanization is likely to present various challenges relating to human health, food security, water and energy needs, aesthetic and recreational spaces. Thus, the United Nations Agenda 2030 premised on economic, social and environmental sustainability may not be realized. This paper focuses on the recreational facilities in Karura Forest located in the peri-urban area of Nairobi City. It uses both quantitative and qualitative research design. In-depth literature review was used to enrich research findings. Data was collected from a selected sample of 1150 Nairobi residents. It provides an inventory of recreational facilities and examines the contribution open and green spaces make to the residents. The preferences of these residents to visit the facilities are also documented. The study found out that about 77.6% of the visitors came from nearby high-income areas of Muthaiga, Nyari, Rosslyn, Peponi and Runda, about 21.4% came from middle-income areas of Parklands, Mlolongo, Athi River and Langata while only a paltry 1% came from the low-income areas of Kangemi, Ngara, Huruma and DeepSea slums. Most of the visitors were between 14 and 52 years of age. Findings are expected to inform policy and future urban planning for green spaces and their recreational value. To ensure sustainable development in the future, there is need to preserve the existing open and recreational green facilities in Nairobi. Both the County and National Governments should formulate and implement the Sustainable Kenyan Cities Policy to preserve open and green spaces in the rapidly growing urban areas of the country.

1. Introduction

Since the second half of the 20th century, globalization together with the unprecedented growth of human population are threatening the sustainability of natural resources by altering the functioning and the structure of the environment (Lee and Maheswaran, 2010) especially in urban areas. Around 1900, urban population was less than 15%, in 1960 it was 34% while in 2020 it increased to 56.2%. Asia has the highest population living in cities, followed by Latin America, Caribbean and Sub-Saharan Africa (UN Habitat, 2020a). By 2050, 68% of the world's total population will be living in urban areas (iied.org/urbanizing-world).

With rapid urbanisation, the importance of suburban recreational forests around the globe has increased. Urban residents retreat to forests to seek relief from stress caused by living in an artificial environment (Song et al., 2016). Therefore, as Sahlin et al. (2016) argue, sustainable cities require ample open and green spaces due to the environmental and health benefits they offer. These recreational spaces are dwindling globally as urban population grows. According to the European Commission (2013) which conducted an analysis of 79 European cities, it found that cities had lost between 7.3 to 41% of their green spaces to other land uses. A similar study by McDonald et al. (2010) in the 274 metropolitan areas of USA found that 1.4 million hectares of the green recreational spaces were lost to development changes. In comparison developing countries are worse off in retaining green spaces to pave way for urban development (Makworo and Mireri, 2011; Song et al., 2016; du Toit, 2018). Absence of green spaces for recreational purposes and carbon sequestration in cities undermines sustainability.

Urban open spaces are often coined with various names including 'public areas', 'recreational zones', 'nature of the city', 'green parks', 'garden cities' and 'eco-parks'. Green space originated from urban nature conservation movement in the UK (Swanwick et al., 2003). There are various definitions for urban green and recreational spaces and all focus

Citation: Shah P. S. and E. M. Irandu, (2022). Recreational green spaces as the future for sustainable cities: Case of Karura Forest in Nairobi, Kenya. J. sustain. environ. peace 5(1) 87–95

https://doi.org/10.53537/jsep.2022.06.001

on the greenery. Fratini and Maroni (2011) have defined urban green spaces as natural or artificial areas covered with vegetation. Cilliers et al. (2013) view urban green spaces as entire urban green infrastructure which focus on both natural and artificial ecosystems.

The UN Habitat (2020b) has defined open spaces as 'sites that are accessible and enjoyable by all without a profit motive and take on various spatial forms, including parks, streets, sidewalks, markets and playgrounds'. This includes recreational green spaces. In Kenya, the National Museums and Heritage Act Cap 216 under the Government of Kenya (GoK, 2009) defines open space as 'an area not built upon in any urban or peri-urban area whether in a municipality or not to which the public has access and which may be used for parks, gardens, recreation grounds or any other use whatsoever'. Kenya is also part of the UN Habitat's Global Public Space Programme which was launched in 2012. Nairobi and Kisumu cities fall under this programme with an aim to bring urban communities' togetherness, improve general well-being and health of citizens and increase their happiness by reducing stress (UN Habitat, 2020b).

According to the World Health Organization (WHO) and Food and Agricultural Organization (FAO), having green space in relation to per person is mandatory. Their recommendation is 9m^2 greenery space per city dweller (WHO, 2017). In Africa, countries have been enforcing strict regulations to ensure that green spaces are maintained. In Cote D'lvoire, it is mandatory for all real estate companies to have 5% devoted for green spaces. However, the green space coverage in African cities has been reducing over the years under the banner of development. According to du Toit (2018), green spaces in most African cities are disappearing with a belief that re-afforestation and afforestation can be done later, thus leading to the imbalance in the trade-offs between natural capital conservation and other land uses. According to White et al. (2017), most African cities have less than 1 m^2 of open space per inhabitant.

West African cities known to be hub of open spaces have greatly deteriorated. In Senegal's Dakar city, green open space reduced by 34% from 1988 to 2008 (World Bank, 2012). The same is depicted for the once known Garden City of West Africa – Kumasi, Ghana. Most of Kumasi's open green and recreational areas have paved way for rapid urbanisation leaving only 10% of the total green area (Nero, 2017). The same trend is for South African cities. Example is of Durban where its estuary accounted for much of the city's green, open and recreational space. By 2020, it had been reduced to 57% and only 3% of its mangrove forests and 4% of its natural shoreline habitat remained (Adams and Rajkaran, 2020). The same is the case for other Durban estuaries which have lost more than 70% of their fish habitat (Adams et al., 2016).

East African cities also have their drawbacks on the open, green and recreational spaces. Addis Ababa in Ethiopia has had most green and open spaces cleared and paved way for housing. By 2010, less than 15% of the city was left with open, green and recreational areas (Dubbale et al., 2010). The city of Dar es Salaam is no exception. Its open spaces along wetlands which require 60 metres of open provision on either side of the rivers has been clogged up by informal settlements. River Msimbazi is one such example (Turpie et al., 2016). The same is the case for Uganda's Kampala city where only 8% of the wetlands area comprise of open as well as recreational spaces (Isunju et al., 2016). The same is the case for wetlands of Nairobi's rivers namely Mathare and Nairobi.

This brings into focus the Sustainable Development Goals (SDGs) specifically SDG 11 which is focused on making cities and human settlements be inclusive, safe, resilient and sustainable. Target 7 of SDG 11 is the focus of this paper. Target 7 states that by 2030, there should be provision of universal access to safe, inclusive and accessible, green and public spaces. The quality of life which urban residents are exposed to is mainly determined by the available green recreational spaces as the greenery has aesthetic and recreational values, provides oxygen, rain, shade, absorbs carbon dioxide and the list is endless. Cities which have greener recreational areas are known to bring in prosperity and general well-being for their citizens (Song et al., 2016; Wood et al., 2018).

Cities need to be ecologically safe where environmental and ecological factors are prioritized together with economic stability. According to the World Bank (2012), there should be interlinkage and interdependence between economic and environmental factors, and both should be able to complement each other. Scientists have also emphasized on having "green mosaics" in urban areas for recreation and biodiversity conservation for economic, social and environmental co-benefits (Ernstson, 2012; Eppler et al., 2015; Song et al., 2016). According to Frederick Law Olmsted who is a well-known landscape architect, the trees are the 'lungs of the cities and urban zones' (Jennings et al., 2012). Today many of the world's cities have become models of economic-environmental sustenance. Such cities include Freiburg in Germany, Auroville in India, Guayaquil in Ecuador and Adelaide in Australia (Estevez et al., 2016) and Bradford in the UK (Wood et al., 2018).

Benefits of urban green spaces

Apart from green spaces which improve the quality of life of urban population and provide environmental services including air and water purification, the filtering of noise and wind, habitats for biodiversity, microclimate stabilization, they also offer social, economic and psychological services (Rook, 2013; Wood et al., 2018). Kaplan and Kaplan (1989) and Gonzalez and Kirkevold (2016) have indicated that the psychological and social services would help in reducing stress, re-energize the city dwellers as well as provide a sense of peace. Table 1 summarizes environmental, economic and social sustainability of urban green spaces.

Green spaces within urban areas are known to provide a good proportion of all outdoor leisure opportunities. For example, a study which was conducted in Finland's city of Helsinki has shown that nearly all (97%) the city residents undertake some sort of outdoor recreational activities during the year, with nearly half of the residents enjoying their outdoor visits on daily or every second day (Neuvonen et al., 2007). Urban green spaces such as forests serve as valuable resources for relaxation, provide emotional warmth

Table 1: Summary of Benefits of Urban Green Spaces

Environmental sustainability	Economic sustainability
• Reduce ambient temperature • Reduce urban Heat Island effect • Pollution control • Preserves natural habitats and biodiversity • Reduces carbon footprints	• Reduces energy use and cost • Attracts tourists and/or investors • Increases land prices and property values
Social sustainability	
• Offers recreational facilities • Reduces stress • Boosts mental and physical health	

Modified from Lange and Rodrigues (2021)

(Shanahan et al., 2016) and reduce depression cases when one spends minimum of five hours per week in a garden (Cox et al., 2017).

Empirical evidence suggests that patients whose rooms face a green space like a park, tend to recover much faster. This clearly shows that urban green spaces can improve the psychological and physical wellbeing of urban citizens (Bolund and Sven, 1999). This has also been proved by anthropology based on the evidence that humans evolved in nature in the plains of Africa and due to conducting activities in the open like hunting and gathering, staying in caves and walking long distances, their bodies did not give rise to lifestyle diseases which are today brought about by the use of artificial light, central heating, automobiles and fatty diets. With reduction in outdoor recreational spaces today, people spend more time on their 'screen spaces' which include smart gadgets and televisions and control them with a button while snacking, thus more lifestyle diseases (Thomson et al., 2008). Furthermore, there is theoretical, empirical and anecdotal evidence to show that both children and adults who spend time for recreation in outdoor settings, have normal blood pressure, cholesterol, stress reduction, positive outlook on life and low behavioral problems (Song et al., 2016). People who walk in open spaces are also found to be less obese (Tinsley et al., 2003; Kaczynski and Henderson, 2007).

The sustainable development of cities and the development of urban spaces are of great importance, not only for the natural environment, but also as an urgent need to improve the lifestyle of urban dwellers. The quality of life in cities is influenced positively by a range of significant roles that urban green spaces play. Green spaces in the city's context contribute to a larger extent to a sustainable city and the improvement of its environment. The importance of urban sustainability is articulated in the UN SDG No. 11: Sustainable cities and communities. A part of this goal stresses the "creation of green public spaces" which cannot be achieved without significantly transforming the way we build and manage our urban spaces (UN, 2015).

A very clear value of urban green spaces has been shown to the global citizens during the Covid-19 pandemic. Amid debates on rushing to develop vaccines and finding cure for the virus, urban spaces have shown that they pay a key role in improving the mental and physical well-being of people (Ugolini et al., 2020). This is an opportunity for Kenya to work on its urban green spaces as it is an eye opener for city planning.

Karura Forest plays an important role in the sustainable development of the City of Nairobi. The forest contributes to the nourishing of the city's existing character, improves environmental conditions, promotes outdoor recreational spaces and active lifestyles, and protects biodiversity by providing wildlife habitats. It also contributes to carbon sequestration thereby enhancing air quality. It leads to the creation of a micro-climate, reduction of the effects of urban heat islands and the reduction of noise pollution. In this way, the forest plays an important role in the improvement of the health of urban residents. A comparison of the benefits of Karura forest with those of a neighbouring green space in Nairobi, the City Park best illustrates their benefits to urban residents.

City Park is an important recreational area, not only for the neighbourhood (Parklands) but also other city residents. Some of the recreational activities in City Park include walking, resting/sleeping, picnics, viewing nature, children's games, photography, jogging, reading, barbecues and choirs among others. The Park is frequented by locals living nearby, who visit the park mainly in the evening and at weekends. A much higher proportion of park users come from residential areas neighbouring the park. Just over 50% of the park users often come from the high density Eastlands residential area compared with 23% originating from the park's adjacent neighbourhoods such as Parklands (Mwangi, 2019).

2. Materials and methods

Study area

The study area is the open, green and recreational space of Karura Forest located in the City of Nairobi. It is important to understand the history of the City of Nairobi to understand the setup of open, green and recreational spaces. Nairobi developed as a historical city due to infrastructure development. Its birth in 1899 was due to the construction of the Kenya-Uganda railway when Kenya was a British Protectorate. At that time, Nairobi was a town with a lot of open space. Its name is derived from the Maasai word 'Enkare Nyrobi' which means a place of cool water. Its status as

Kenya's capital city dates back over a century ago in 1905 (nairobi.go.ke/history/). It got the city status in 1950. Since then, Nairobi's population has been growing exponentially both naturally and through in-migration.

In 1906, Nairobi had a population of about 11,512 people, but grew rapidly to reach 342,764 people at independence in 1963. After independence, the city's population grew rapidly. In 1969 it was 509,286, rising to 1,324,570 people in 1989. In 2009 it rose to 3,138,369 and in the latest census of 2019, it increased to 4,397,073 (KNBS, 2019). Such a big population increase led to a huge demand for more green and open spaces for recreational purposes and to make the city more livable. This is what led Obudho (1988) to observe that, the city has not been able to provide enough green, open and recreation public spaces to meet the residents' demands for a good quality of life.

The idea of having green, open and recreational spaces in Nairobi originated from the British colonialists and was incorporated in the City's 1948 Master Plan. The plan allocated 27.5% of the city's land to open, green and recreational spaces. However, with population growth, the open and green recreational space was not enough. With independence, the city's priority and focus changed. The City authorities concentrated on poverty alleviation and construction of decent housing for the growing population and improving accessibility through road expansion (Makworo and Mireri, 2011). Moreover, the 27.5% of the total land area allocated to open and green spaces was seen as lot of 'idle' land and went to private developers, illegal land grabbers and political party loyalists (ibid). At the same time, open spaces which do not generate revenue are considered a burden to the County Government and are given low priority in the spatial planning of the city (Muiga, 2009; Muiga and Rukwaro, 2017).

Before 2000, the City of Nairobi was often referred to as the "sunshine city" or "green city in the sun". This was because the city boasted of large open and green spaces which have been shrinking over time. The total green space in Nairobi is 9.86% of the total Nairobi Metropolitan Area which is 704 km^2 in size (Okech and Nyadera, 2021). Today, few such spaces are left which include Ololua Forest, Ngong Forest, Michuki Park, Nairobi National Park, City Park, Arboretum, Giraffe Centre and Karura Forest. It also has green spaces through the well-preserved open spaces including Uhuru Park, Uhuru Gardens, United Nations Environment (UNE) and the Muthaiga Golf Club. The Nairobi National Park is the only national park in a capital city globally.

However today things have changed as most of its vegetation and open spaces have reduced like the Nairobi National Park has paved way for the Standard Gauge Railway and the bypass. The same is the case for Uhuru Park which has been reduced for the Nairobi Expressway. At the same time, the access to green urban spaces is mainly for the rich as most of these spaces are in the high-end areas of the city (Okech and Nyadera, 2021). To have an equitable access to green spaces for all, the authorities must consider the right to clean, safe and healthy environment as stipulated under the Government of Kenya 2010 Constitution (GoK, 2010). Nairobi's environmental health has deteriorated though efforts towards reafforestation and afforestation have been on-going but at the same time with the Nairobi expressway, there is more reduction in green spaces. The city's open, green and recreational areas are shown in Fig. 1.

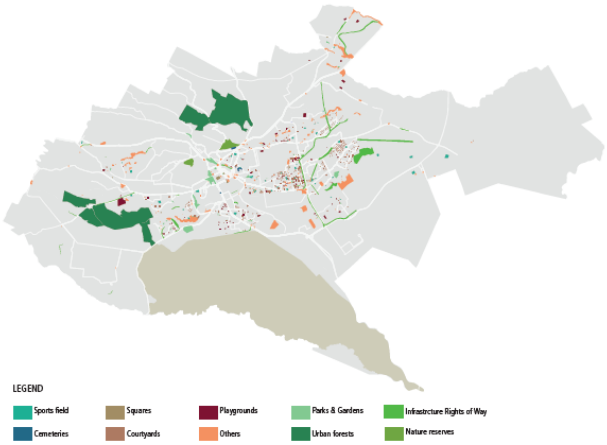

Fig. 1. Open, green and recreational spaces of Nairobi (UN Habitat, 2020b)

Karura Forest

Karura Forest is an urban forest in the heart of the city of Nairobi. The forest is located to the north of the city and was established in 1932. This is when the colonial government set it aside as a source of fuel wood for the new Uganda Railway. Due to this, three quarters of the forest was felled and replanted with exotic species such as Cypress and Eucalyptus (Macharia, 2014). Karura forest is one of the largest gazetted forests in the world fully within a city limits (Wily and Mbaya, 2001). The current size of the forest is 1,041.3 hectares, consisting of two blocks, namely, Karura (765.9 ha) and Sigiria (275.4 ha). Karura is a remnant of the montane sclerophyllous (small leaves) forest that covered all of the Kenya highlands from Nairobi to the Aberdare moorlands in pre-colonial times. It has always been a place of bounty for the Gikuyu people who traditionally used the forest for food, fuel and fiber, as a sacred burial place and source of herbal remedies.

The forest is home to the Kenya Forest Service (KFS) Headquarters. Karura Forest is also a wetland and forms part of the Nairobi River Basin. It is protected and jointly managed by KFS, Friends of Karura Forest (FKF) and the Karura Forest Environmental Education Trust whose members are Vivo Energy, Green Belt Movement and the Oshwal Education and Relief Board (Shah and Irandu, 2015; FKF and KFS, 2016).

The topography of the Karura forest is gently sloping and has shallow valleys. In terms of geology, the forest lies on Tertiary volcanic rocks forming volcanic tuffs with intercalated flows of basaltic larva. Both types are occasionally exposed in Karura's deeper river valleys, and the tuffs yield the familiar grey building stone of Nairobi. It experiences a bimodal rainfall pattern from the months of April to June and October to December. Average annual rainfall is 928.3 mm. Temperatures range between 8° and 28°C. The soils are well formed through weathering, consisting mainly of black cotton. There are five rivers namely Ruaka, Karura, Gitathuru, Thigiri and Mathare which pass through the forest (ibid). The forest also has two lakes – Lily and Butterfly.

Karura forest is part of the former European reserved neighbourhoods which are still well endowed with natural green spaces. The former European reserved areas are currently inhabited by upper middle-class citizens, consisting of a mixture of Europeans, Indo-Asian Kenyans and wealthy black African Kenyans. The Sigiria section which is the western section is surrounded by Peponi, New Muthaiga, Gigiri and Rosslyn Estates. The Karura section which is on the east is bounded by Kiambu Road, Thika Road and the Muthaiga Golf Club, with the latter being part of the forest land (Mbatia, 2016).

Due to its location, Karura Forest like other open and green spaces in Nairobi is not easily accessible to the majority of the low-income and urban poor people living in the eastern marginalized peri-urban areas, as well as some middle-income persons from other suburbs. It is mostly the affluent and upper middle-income residents of the city who can easily access these open and green spaces in the city (Makworo and Mireri, 2011; Mbatia, 2016).

Karura Forest is one of the last remaining indigenous forests in the city of Nairobi. It acts as a natural carbon sink for the largest industrial city in the country. It is an important water catchment area with relaxation and recreational value for Nairobians. In terms of vegetation, indigenous trees include Brachyleana huillensis (Muhugu) and Newtonia buchananii. The forest includes vast sightings of animals like bush babies, bush bucks, porcupines and monkeys. There are a variety of reptiles like snakes and bird species such as vultures, Hartlaub's Turaco and sparrows (Njoroge et al., 2013). The forest has beautiful scenery and includes waterfalls, caves and rivers as well as other recreational activities like walking and jogging.

Research design and data collection

In terms of research design, the study used both quantitative and qualitative approaches. Quantitative approach was used to collect numeric data to get results of interest using bar graphs and percentages. Qualitative approach was used to collect extensive narrative (non-numeric) data to get insights into what more the visitors expected as recreational facilities in the forest. It also included open-ended questions for respondents to express their own views.

The Karura Forest study was conducted between December 2012 and December 2016 during which a total of 793,548 visitors had paid a visit to the forest. In 2012 the forest had 68,071 visitors, in 2013 108, 170 visitors, in 2014 there were 187,835 visitors, in 2015 197,124 visitors and in 2016 232,348 visitors. A questionnaire survey was carried out on the visitors of Karura Forest from those aged 12 years and above to examine the recreational facilities they used in the forest. The visitors were initially segregated into residents and non-residents and only residents were selected for the research. The residents were further categorized into adults and children. Those between 12 and 18 were categorized as children and above 18 years of age, as adults. After selecting Nairobi residents, random sampling technique was used to select the desired sample size. Samples were selected on the last day of December each year after getting the total number of visitors to the Karura forest that year. In 2012, 150 respondents were selected; in 2013, 200 respondents; in 2014, 250 respondents were selected and in 2015, 250 respondents and in 2016, 300 were selected. A total of 1150 samples was selected. Selection of the samples was based on the total number of visitors to the Karura forest each year.

Both primary and secondary data was collected. Primary data was obtained from the forest visitors using questionnaire survey to get their views on the recreational facilities in the open space of the forest, their uses and management solutions. The main aim of the data collection was to get information from the visitors regarding the recreational value of the Karura Forest. For secondary data, available literature provided valuable insights on urban recreation in forests, urban ecotourism and lessons learnt from other cities of the world. Field observation by the authors was used to supplement information obtained using the questionnaire survey and literature review. Data analysis was done using the software of Statistical Package for Social Sciences (SPSS) and R Stata. It was then summarized using descriptive statistics such as percentages, frequencies, cross tabs and presented using graphs, tables and charts.

The number of adults selected tended to be more because during the pilot study, it was determined that most children came with their schools with a mission of learning and fun-filled activities. At the same time, the number of adults visiting the forest have always been more than the children so the justification behind having more adults than children in the sampling. The distribution pattern of selection is shown in Fig. 2.

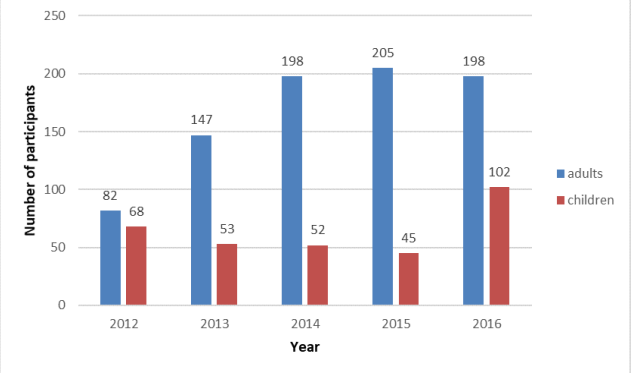

Fig. 2. Respondents' selection from 2012 to 2016

3. Results

The questionnaire survey involved 1150 respondents of which 722 (62.78%) were males and 428 (37.22%) were females. The respondents were asked to state their place of residence in the City of Nairobi. Analysis of the results indicated that 77.6% of the visitors came from nearby estates of Muthaiga, Nyari, Rosslyn, Peponi and Runda which coincidentally are high-income areas. About 21.4% of the visitors came from the middle-income estates of Parklands, Mlolongo, Athi River and Langata while the remaining 1% came from the low-income areas of Kangemi, Huruma and Deep Sea slums.

Most of the visitors were between 14 and 52 years of age. This finding is consistent with that of Mbatia and Owuor's (2014) which showed that the age of the visitors to Karura Forest was between 14 and 39 years. This research also established that most people visited the forest regularly with

some visiting daily or thrice a week.

The visitors were asked to list all the recreational facilities offered at the forest. These are nature trails for walking, jogging and running; horse riding tracks, biking and cycling tracks; picnic spots, Mau Mau caves; the Lily and Butterfly Lakes; River Café Restaurant; education centre with a theatre; biodiversity; the newly introduced attraction of the Colobus monkeys (Colobus guereza); dog shows; the forest scenario; tennis court; football pitch and exercising facilities.

The visitors were also asked to give the reasons for visiting the forest. A total of ten reasons were given. These included biking/cycling, horse riding, walking/jogging, picnic, enjoying fresh air, beauty, enjoying meals at the Karura River Café, watching movies at the education centre, watching wildlife and relaxing. About 93% of the respondents mentioned recreational activities (Fig. 3).

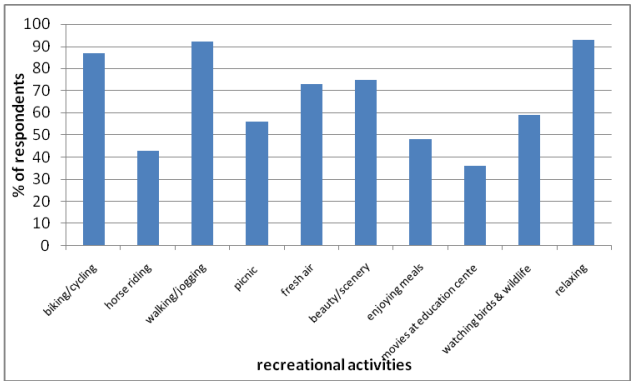

Fig. 3. Reasons for visiting Karura Forest

This study also realized that most of the respondents preferred to go relaxing, walking/jogging as well as viewing of colobus monkeys. However, activities like horse riding, playing tennis, watching movies and going to the Café were not amongst the favorites as they were ranked as the least preferences. This is because these activities could also be done elsewhere in comparison to activities like relaxing and walking in the fresh air (Table 2).

Table 2. Ranking Karura Forest recreational activities in terms of preferences

Activity	Rank
Biking/cycling	4
Relaxing	1
Walking/jogging	2
Fresh air	4
Watching birds and animals	4
Special viewing of colobus monkeys	2
Playing football	7
Horse riding	9
Picnics	3
Enjoying forest beauty	7
Movies	9
Karura River Café	9
Playing tennis	9

The respondents of this study were also asked if they would be interested in having more recreational activities. The result indicated that 72% were satisfied with the recreational facilities offered while 28% felt that more recreational activities could be added at the forest. Those who stated that they would like to have more recreational facilities were further asked to list recreational facilities they wanted to see in the forest. There were five responses which were swimming pool, fishing, boating, camping and camel riding. A majority of 87% wanted fishing and camping to be part of the recreational facilities, followed by boating at 83%, swimming at 79%, and camel riding at 20%. This is shown in Fig. 4.

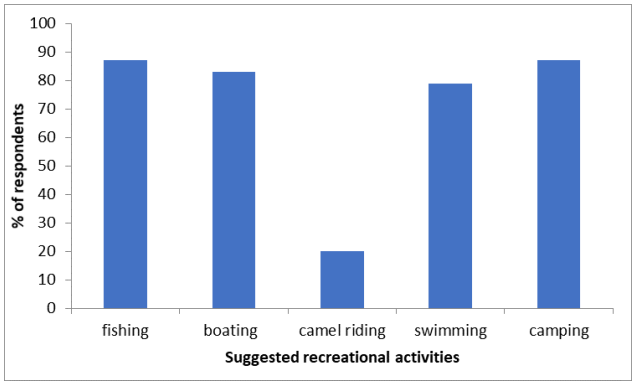

Fig. 4. Suggested additional recreational activities in Karura Forest

4. Discussions

This study examines the respondents' preferences for visiting Karura Forest. In discussing the results, reference is made to similar findings in other parts of the world or divergences if any. It was established that Nairobi residents visited Karura Forest for recreational purposes. The visitors associated the forest with aesthetic values, fresh air and recreation which included cycling, jogging and walking. Relaxation according to the respondents means that they feel so "free" of stress and are relieved of any tension when they come to the forest. Some even indicated that the forest makes them feel healthy. This indicates that the forest has a physiological impact on people in terms of both mental and physical aspects. This finding is consistent with what Song et al., (2016) found in their study of the physiological effects of forests in Japan. The finding is further corroborated by the study of Bielinis et al., (2019). Bielinis et al., (2019) found out that people visit forests and open green spaces for therapies which are health-related and include relaxation and keeping fit activities. They observed that recreational activities have positive impacts on one's health and well-being. Therefore, based on the results of this study, it has been established that green spaces play an important role in enhancing the quality of life of city residents.

The present study found out that walking and enjoying nature such as watching wildlife are important forms of forest recreation. Šodková et al, (2020) arrived at the same finding in their study of drivers and frequency of forest visits in the Czech Republic. They established that the driver for walking was the strongest motivation for people to visit forests. Romagosa (2018) and Getzner and Meyerhoff (2020)

also had a similar finding. The study also found out that the visitors' preference to the Karura Forest tends to change with time. The visitors pointed out that despite being satisfied with the existing recreational activities, they would be happier if swimming pool, fishing, boating, camping and camel riding were introduced. Additional recreational facilities and activities would very likely attract more visitors to the Karura Forest.

The viewing of the Colobus monkey re-introduced to the Karura Forest between 2014 and 2016 was found to be the second-best preference for visiting the area. They used to be there in the 1950s but due to deforestation and hunting, the species disappeared. With the help of the Institute of Primate Research (IPR), FKF, KFS, Kenya Wildlife Service (KWS) and the African Fund for Endangered Wildlife (AFEW), the highland monkeys have been relocated to Karura Forest from Kipipiri Forest in the Aberdares where they are under threat as their habitat is being destroyed to pave way for settlements and farming forcing them to suffer from food shortages (FKF, 2019). This forest is linear in nature and thus good for biodiversity habitat. The findings of this study echo findings in other studies which indicate that people have greater preference for recreation in biodiversity rich areas (Pett et al., 2016). Karura Forest is a linear recreational space which accommodates biodiversity and has proved to be a recreational attraction for visitors.

The Management of the Karura Forest has really tried to cater for additional recreational activities but also faces insurmountable challenges. These include financial challenges as entry charges for the Karura Forest are minimal. The daily entry fee per citizen child is Kenya Shillings (KES) 50 (USD 0.5), non-resident child KES 100 (USD 1) citizen adult KES 100 (USD 1) and non-resident adult KES 200 (USD 2). Other costs incurred include security, maintenance and paying staff. Another challenge is invasive species which affects biodiversity especially Lantana camara L. The management also faces inadequate funding to maintain the necessary infrastructure to keep the forest safe, secure and accessible to visitors of any age and ability. Due to its close proximity to the city and its pristine value, the threat of land grabbing in Karura Forest is imminent thus making the forest's future unsafe.

It has been established in the present study that many residents living in poorer parts of the City of Nairobi find it difficult to access open spaces such as Karura forest. This can be attributed to the fact that vulnerable groups such as women, children, old people and physically challenged persons tend to live in neighbourhoods with little available green space. Besides, these people are also ''mobility poor''. By providing access to urban green spaces by developing public transport infrastructure from residential areas to open spaces, would play a major role in improving their wellbeing. This would make it safer for women and children to visit and relax in these open spaces. Physically challenged and older persons would also be able to access the recreational facilities available in the open spaces. This way, it would be possible to achieve the SDG 11 target 7. SDG 11 target 7 aims to provide by 2030, universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.

Due to the concentration of people, infrastructures, housing and economic activities, the City of Nairobi like other cities of the world is vulnerable to climate change and natural disasters such as flooding. Therefore, the city needs to build resilience to avoid human, social and economic losses. This can be done by protecting its open and green spaces such as Karura Forest which are threatened by rapid growth of the city. Increasing urban greenery could help mitigate climate change and natural disasters. This would make the city more liveable and enable it to achieve the sustainable city status.

However, to ensure sustainability of the forest and greater visitor satisfaction, KFS needs to come up with sound visitor management strategies as tools to safeguard biodiversity and ecosystem services. Green spaces assume a key role in the efforts towards enhancing the urban environment and improving the quality of urban life and play a key role for performing sustainable ideals. More studies should be carried out to provide on-site data for evaluating the demand for outdoor recreational opportunities within the Karura Forest. Such data would also form the basis for multifunctional forest management, and also for creating awareness on the importance of urban green spaces.

Conclusion

Based on the findings of the study, it can be concluded that the Karura Forest has many benefits for the residents of Nairobi. These benefits include opportunities for recreation, wildlife viewing and biodiversity conservation. The study further concludes that urban greenery has a pivotal role in providing clean air for residents, thereby improving their health. Residents of all ages find the forest full of recreation activities and they are keen on having the forest preserved sustainably for more recreational opportunities. However, these findings are restricted to the Nairobi residents and further studies are required to establish the recreational benefits of the forest to visitors from within and outside the country.

The study recommends that to prevent grabbing of the open and recreational green facilities in the urban areas by the private developers, the country needs to come up with a Sustainable Kenyan Cities Policy which needs to highlight that no green and open spaces should be touched for any activity – be it for the common good or individual good. Such a Policy should also highlight the nexus between sustainability, natural ecosystems and recreation as a means of educating people. Once such a Policy is in place, then the next thing would be to have legal frameworks in place to implement the Policy.

Acknowledgements

We acknowledge the Karura Forest staff especially Lucy and Chege for sharing such vital information as well as all respondents without whom, this study would not have been possible.

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